

User's Manual for **VASA** (Vibrational Acceleration Statistical Analysis) Software

by R. Miller

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**VASA concept and programming:
Walter Utt, Ian May**

This copy of VASA was developed on Windows 2000. It has also been successfully installed on Windows 95, 98, and NT. If you have difficulty installing it, please contact Rusty Miller at Spokane Research Laboratory.

Installing VASA100 for Windows

Step 1: The first item is to download the install program by clicking [VASAPACK.exe](#) on the same page where you found these instructions. A window should appear similar to figure 1.
Note: All screen capture pictures in this manual have a red line through them so the user does not confuse active windows with these figures.

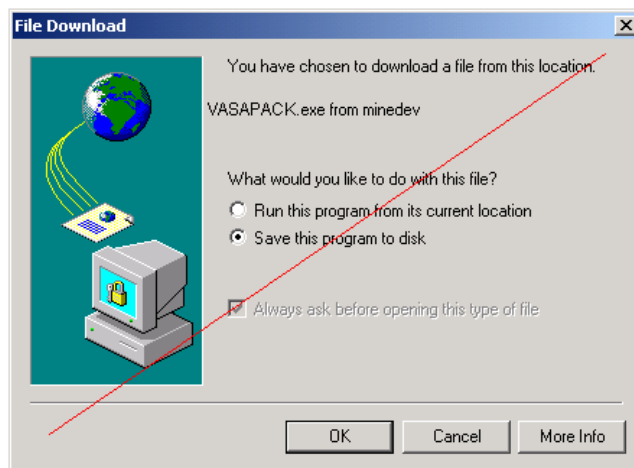


Figure 1: Download window number one

Step 2: Click once on the **OK** button. The computer should bring up a window similar to figure number 2.

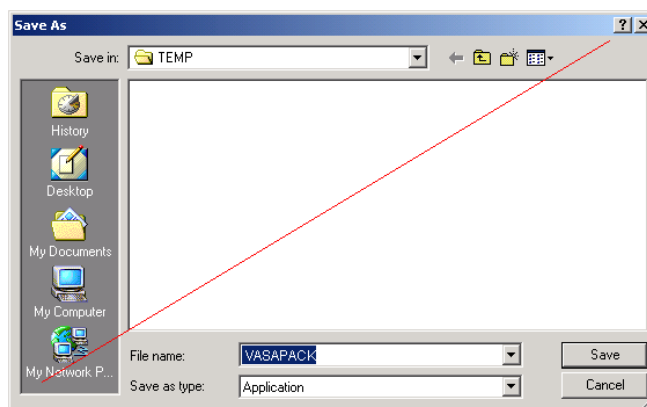


Figure 2: Download window number two

Step 3: Locate the **Save in:** part of the window as circled in figure 3.

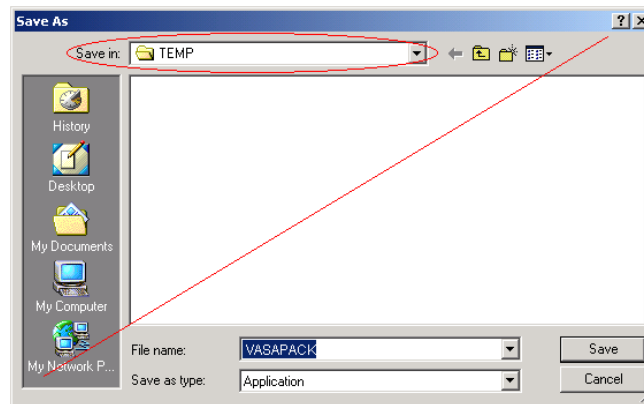


Figure 3: Note “Save” location

Step 4: You want to get **Desktop** next to the **Save in:** as shown in figure 4. Click on the up directory icon circled in figure 4 until **Desktop** is shown. If you are stuck at this point, seek help from your local system administrator.

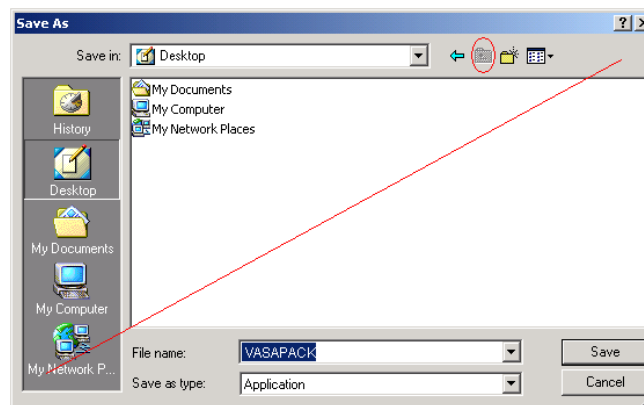


Figure 4: Locate Desktop with Up Folder

Step 5: Click once on the **Save** button in the lower right corner of the window as shown in figure 5.

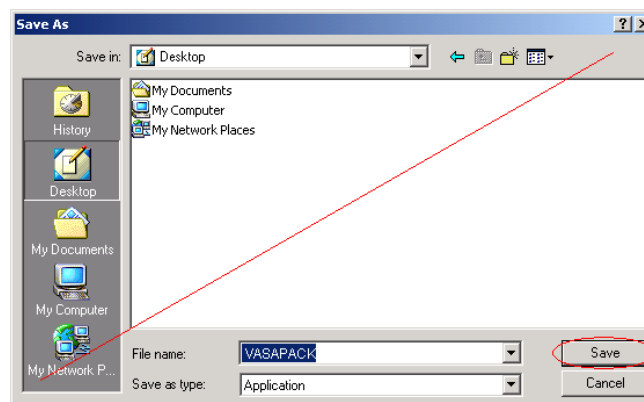


Figure 5: Click on Save to save the file

Step 6: You may see a window similar to figure 6 while the computer downloads the file. If so, when the progress bar is complete, click once on **Close**. If there is an error during the download, then return to step 1.

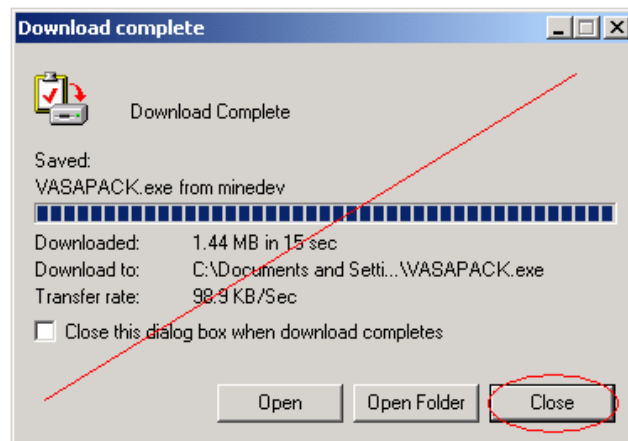


Figure 6: Download complete window

Step 7: Now go to your desktop and double click on the **VASAPACK** icon. The name VASAPACK stands for “packed VASA” and now what we are going to do is unpack, also called unzipping or extracting, the program and install it on your computer. On the computer which this sample was created, the desktop and VASAPACK icon looked like figure 7.

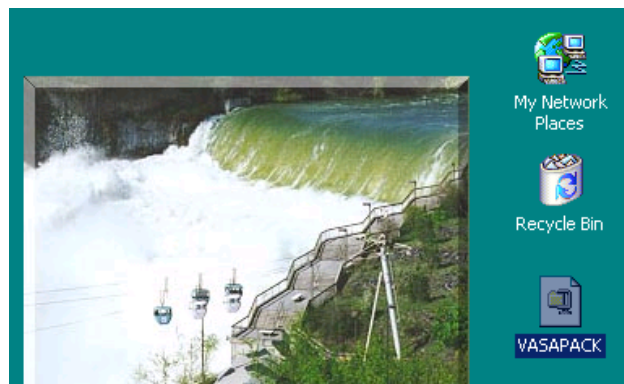


Figure 7: Find the VASAPACK icon on your desktop

Step 8: When the **VASAPACK** program is run, a window appears similar to figure 8. Click once on the **Unzip** button.

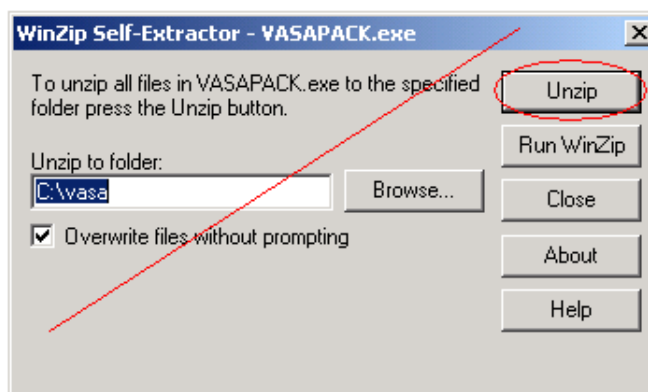


Figure 8: Opening window of VASAPACK

Step 9: After the computer operates for a brief moment, a window similar to figure 9 should appear. Click once on the **OK** button.

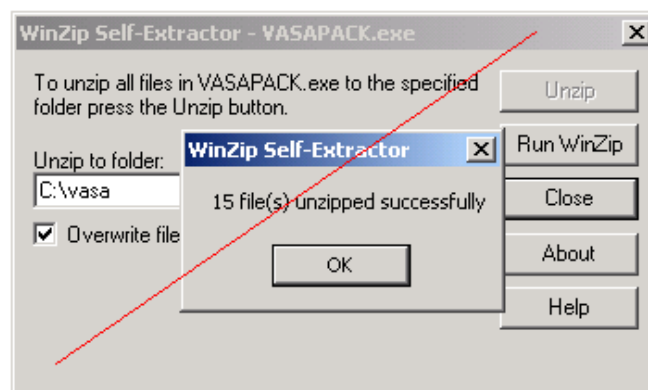


Figure 9: Successful unzipping of VASA

Step 10: Click once on the Close button as shown in figure 10.

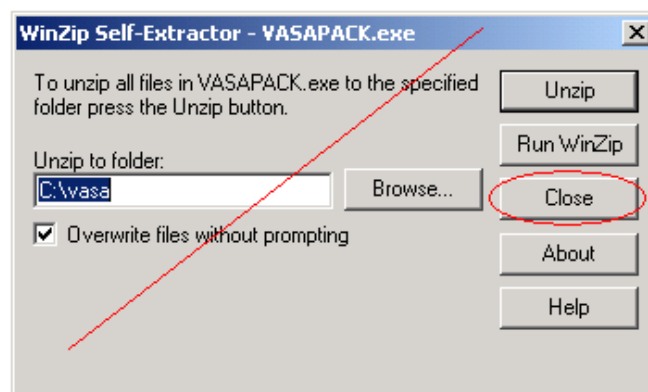


Figure 10: Click on the Close button to exit VASAPACK

Step 11: Using Windows Explorer, search for and run the program **setup.bat** in C:\vasa Click the **OK** button when prompted, twice, to confirm the successful registration of the program with your computer. Consult your Windows users manual if unsure how to search for and run programs using Windows Explorer. Windows Explorer is a standard part of Windows.

Step 12: Depending on whether you want to keep the install program or delete it, you may want to drag and drop VASAPACK to the recycle bin on your desktop now.

Step 13: Using Windows Explorer, search for and run the installed VASA program **VASA100.exe** in C:\vasa The opening window is figure 11.

Running VASA100:

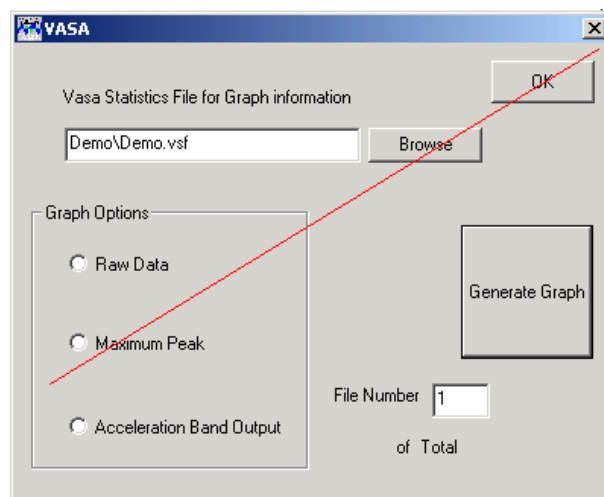


Figure 11: Opening window of VASA100

Demo.vsf is the VASA Specification File (.vsf extension) default data file.

First thing to do is to select a **Graph Option** by clicking once on one of the white dots towards the bottom left of the VASA window. If you try to generate a graph before selecting a graph option then you get an error message. Here are descriptions of the graph options:

Raw Data (Time Domain Data)

The raw data window is for plotting the acceleration in g (9.81 m/s^2) as a function of the sample number. The term “sample number” comes from an electronics point of view. For the demo data, the data logger electronically sampled the accelerometers 512 times per second. The length of each acceleration “event” was 8 seconds. Therefore for each graph of the raw data window, there are 4096 samples on the X axis of the graph and a corresponding g value on the Y axis of the graph.

Maximum Peak

This window gives the user a quick look at the maximum acceleration peaks for all of the events. It is explained in greater detail below.

Acceleration Band Output

This graphs shows the percentage of samples which end up falling into the various acceleration bands. The acceleration is “weighted” as a function of Hz, in the frequency domain, according to ISO 2631. See explanation below. The bottom of the window shows the Vibration Dosage Value of the data.

In the full version of VASA 1.0, clicking **Generate Graph** with no .vsf file selected activates the VASA file conversion/import routines to input acceleration data. As long as the data is ASCII compatible, then a subroutine is either already available or we can modify one to accept your raw data. For the purposes of this demo version, **Demo.vsf** has been provided. SRL has more field data in .vsf format, which can be made available upon request. Typical raw ASCII data for VASA has time data in the first column and then acceleration data in the subsequent columns. For example, see **Demo-1.txt** in C:\Vasa\Demo. The time interval between rows must be consistent or assumed to be consistent in order for VASA to function. Click on **Generate Graph** and give VASA a few seconds to process the file. CAUTION: The tendency is to double click this icon or to click **OK** in the upper right corner. However, the **OK** at this stage in the program is for exiting the program!

Once you have selected a Graph Option – example: Raw Data

Go to the VASA main menu and select the **Raw Data** option and click once on **Generate Graph**. The following descriptions will guide you through the options as you click on the various icons.

Let’s first look at the upper left corner. See the **3D/2D sunglasses**? These toggle the display between a 2D and 3D perspective.

The magnifying glass is the **Zoom** feature. Just toggle it on and then “click and drag” over the area on the graph that you wish to enlarge. To “unzoom” just toggle the magnifying glass off and you’ll be back to the previous view. The next four icons are **Print Preview**, **Print**, and **Grid lines**, respectively. CAUTION: The print option prints all 4096 points!

Now let’s explore the other options in this Raw Data window. Dimension refers to the ISO 2631 coordinate system. It is a “right handed” system for those that are familiar with that expression. If you were seated in the driver’s seat of a vehicle, then positive X is straightforward, positive Y is to your left, and positive Z is towards the top of your head or the sky!

At this point in learning VASA it is helpful to jump down to the lower left of the display and enter 4096 in the **number of data points** box. See how the initial 1500 samples which were

shown are still displayed, but the sample number scaling has changed to accommodate the rest of the event? Now enter a different event number in the **Event** box. Click on the current number, 1, delete it using either the backspace or delete key, type in a new number and either hit Enter on your keyboard or click on **Redraw Graph** in VASA. Event 6 looks like this..

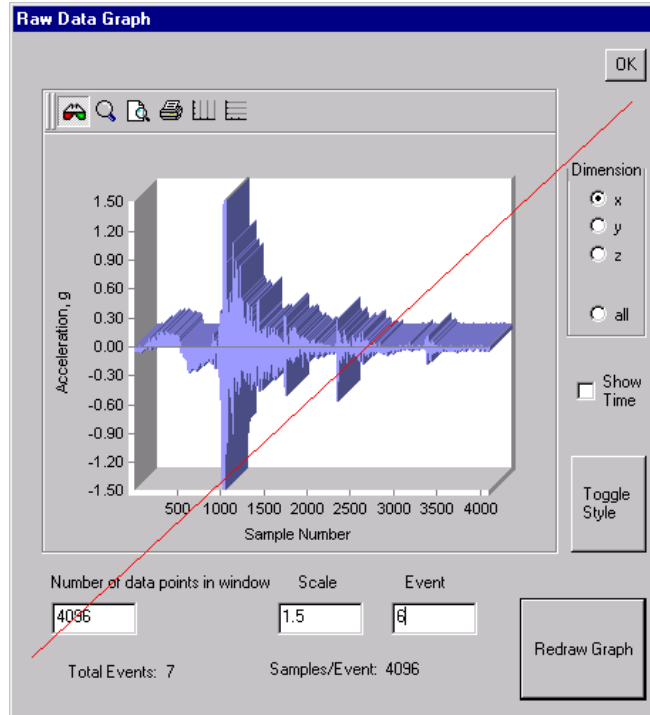


Figure 12: Change of event

NOTE: The **Event** parameter may take a little bit of work to grasp. An event as defined here is a section of real time acceleration data. In real time, these events were spread out over several hours. For the demo file, 7 acceleration events were recorded. Each one has 12,288 separate points where acceleration values were recorded. 4096 times three (X,Y, and Z dimensions). Therefore, the digital data logger recorded a value $7 \times 12,288$ or 86,016 times. This covered a period of 56 seconds of data logging. Currently, there is no way in the program to simply click or slide from one event to the next.

The **Show Time** toggle will show a time scale. For example, in this demo data, sample number 128 for each event occurred 0.25 seconds after the start of data collection.

The **Toggle Style** icon is an important feature because it makes it easier to view the data points, especially when there is a portion of the data with a high Hz value. One way to check it out is to click on the **All** option under dimensions and then click on **Toggle Style**. This feature is even more effective if the number of data points in the window is set low. Try to duplicate figure 13. Toggle through all 4 styles to determine which one you like best.

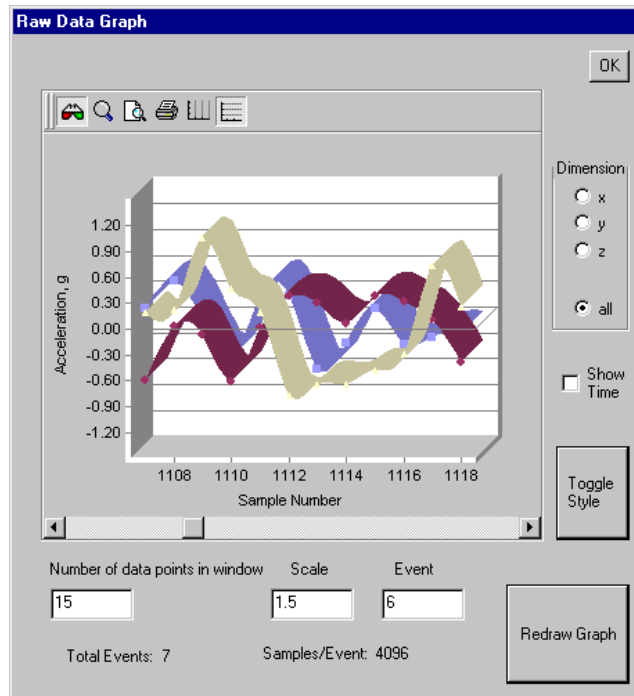


Figure 13: Graph style toggle

The **Scale** feature changes the maximum number on the Y axis of the window.

If you're feeling confident at this point in reading the user's manual, then click once on **OK** in the upper right hand corner of the display. This should take you back to the overall graphics menu where you first clicked on Raw Data.

Maximum Peak Window

Now select **Maximum Peak** and then **Generate Graph**. This screen doesn't have as many features as the Raw Data window. However, the ones it does have function the same as in Raw Data. For each sample number 1 through 4096, VASA looks over all of the events and figures out which event has the highest acceleration. This is perhaps difficult to visualize or one may wonder why this is useful. This is most helpful when the user first looks at the raw data to get a qualitative idea of the overall acceleration picture. The acceleration values shown are "weighted" as a function of Hz according to ISO 2631. See the explanation below.

Click **OK** in the upper right hand corner to return to the overall graphics menu.

Acceleration Band Output

Select **Acceleration Band Output** and then **Generate Graph**.

This screen has even fewer features than either the Raw Data or Peak windows, but the ones it does have function the same as the others. This graphs shows the percentage of samples which end up falling into the various acceleration bands. The acceleration is “weighted” as a function of Hz according to ISO 2631. Within the ISO 2631 standard, there is a chart with Hz values in one column and corresponding multipliers for each direction (X,Y, and Z). The multipliers change depending on the human body’s sensitivity to vibration at a stated frequency. For some frequencies the constant is higher than 1 and for others is it lower than 1; thus accomplishing the weighting of the accelerations according to their associated Hz (frequency). For example, if the measured acceleration is 2 g at 5 Hz in the Z direction, then the weighted acceleration for a single jolt would be (from the chart) 1.039 times 2 g or 2.078 g. The bottom of the window shows the Vibration Dosage Value of the data, 1.7 Extra decimal places are provided, but should be reported in accordance with the accuracy of the original data.

For the X dimension, 16.67 percent of the sample points from the 7 events resulted in “weighted” accelerations which fell within the 3rd acceleration band. The 3rd band is from 0.3 to 0.6 g. The single jolt upper and lower bounds were used for the graph.

The bounds of the acceleration bands are as follows.

	Single Jolt		One Hour	
Acceleration Band (weighted accelerations)	Lower Bound (g)	Upper Bound (g)	Lower Bound (g)	Lower Bound (g)
1	0	0.15	0	0
2	0.15	0.3	0.075	0.025
3	0.3	0.6	0.15	0.05
4	0.6	1.5	0.3	0.1
5	1.5	2.4	0.6	0.2
6	2.4	3.4	0.8	0.3
7	3.4	10	1.4	0.5
8	10	15	8	3
9	15	25	13	4
10	25		23	8